WHAT IS CLAIMED IS

1. A method for manufacturing a semiconductor device comprising the steps of;

forming a film to be processed on a substrate;

forming a mask material on the film to be processed;

forming a resist pattern on the mask material;

patterning the mask material using the resist pattern as a mask;

shrinking a patterned mask material;

patterning the film to be processed using a shrunk mask material as a mask; and

removing the shrunk mask material.

2. The method for manufacturing a semiconductor device according to claim 1,

wherein a metal film is formed as the mask material.

3. The method for manufacturing a semiconductor device according to claim 2,

wherein a ruthenium film is formed as the mask material, and

the shrunk mask material is removed together with the resist pattern using oxygen-containing plasma.

4. A method for manufacturing a semiconductor device comprising the steps of;

forming a film to be processed on a substrate;

forming a ruthenium film as a mask material on the film to be processed;

forming a resist pattern on the mask material;

patterning the mask material using the resist pattern as a mask;

patterning the film to be processed using a patterned mask material as a mask; and

removing the patterned mask material.

5. The method for manufacturing a semiconductor device according to claim 4,

wherein the patterned mask material is removed together with the resist pattern using oxygen-containing plasma.

6. The method for manufacturing a semiconductor device according to claim 5,

wherein the patterned mask material is removed in the state that a metal material is exposed on the substrate.